


RETURN TO ISSUE |  PREV ARTICLE NEXT 

JOURNAL OF
AGRICULTURAL AND
FOOD CHEMISTRY

Zinc Ionophore Activity of Quercetin and Epigallocatechin-gallate: From Hepa 1-6 Cells to a Liposome Model

Husam Dabbagh-Bazarbachi[†], Gael Clergeaud[‡], Isabel M. Quesada[§], Mayreli Ortiz[‡],
Ciara K. O'Sullivan^{*‡||} and Juan B. Fernández-Larrea^{*†}

View Author Information 

 **Cite this:** *J. Agric. Food Chem.* 2014, 62, 32, 8085-8093

Publication Date: July 22, 2014 

<https://doi.org/10.1021/jf5014633>

Copyright © 2014 American Chemical Society

[RIGHTS & PERMISSIONS](#)

Share Add to Export



PDF (6 MB)

More Access Options

Article Views

647

Altmetric

-

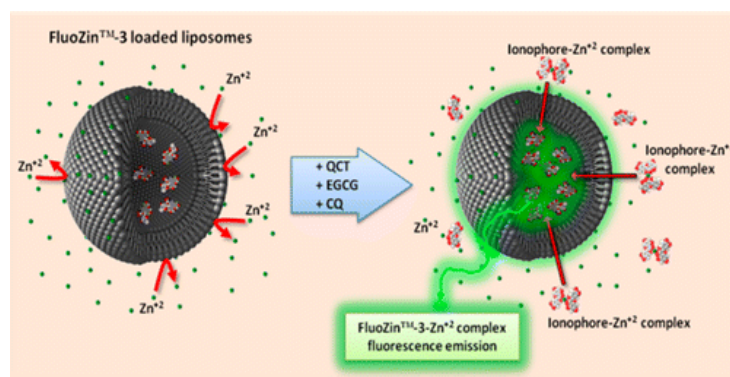
Citations

11

[LEARN ABOUT THESE METRICS](#)

SUBJECTS: Vesicles, Zinc, Flavonoids, Organic compounds Phytochemistry

Abstract



Labile zinc, a tiny fraction of total intracellular zinc that is loosely



Of numerous enzymes that are targeted by polyphenols are dependent on zinc. We have previously shown that these polyphenols chelate zinc cations and hypothesized that these flavonoids might be also acting as zinc ionophores, transporting zinc cations through the plasma membrane. To prove this hypothesis, herein, we have demonstrated the capacity of QCT and epigallocatechin-gallate to rapidly increase labile zinc in mouse hepatocarcinoma Hepa 1-6 cells as well as, for the first time, in liposomes. In order to confirm that the polyphenols transport zinc cations across the plasma membrane independently of plasma membrane zinc transporters, QCT, epigallocatechin-gallate, or clioquinol (CQ), alone and combined with zinc, were added to unilamellar dipalmitoylphosphocholine/cholesterol liposomes loaded with membrane-impermeant FluoZin-3. Only the combinations of the chelators with zinc triggered a rapid increase of FluoZin-3 fluorescence within the liposomes, thus demonstrating the ionophore action of QCT, epigallocatechin-gallate, and CQ on lipid membrane systems. The ionophore activity of dietary polyphenols may underlay the raising of labile zinc levels triggered in cells by polyphenols and thus many of their biological actions.

KEYWORDS: clioquinol, epigallocatechin-gallate, flavonoids, liposomes, quercetin, zinc ionophores

To access the full text, please choose an option below.

Get Access To This Article



Loading Institutional Login Options...

Log In with ACS ID

ACS members enjoy benefits including 50 free articles a year and reduced priced individual subscription.

[Learn More](#)



Cited By

This article is cited by 11 publications.

1. Hugo Granda, Sonia de Pascual-Teresa. Interaction of Polyphenols with Other Food Components as a Means for Their Neurological Health Benefits. *Journal of Agricultural and Food Chemistry* **2018**, *66* (31) , 8224-8230. DOI: 10.1021/acs.jafc.8b02839.
2. Paula Fernández-Palanca, Flavia Fondevila, Carolina Méndez-Blanco, María J. Tuñón, Javier González-Gallego, José L. Mauriz. Antitumor Effects of Quercetin in Hepatocarcinoma In Vitro and In Vivo Models: A Systematic Review. *Nutrients* **2019**, *11* (12) , 2875. DOI: 10.3390/nu11122875.
3. Takaaki Aratake, Youichirou Higashi, Yusuke Ueba, Tomoya Hamada, Takahiro Shimizu, Shogo Shimizu, Toshio Yawata, Tetsuya Ueba, Motoaki Saito. The inhibitory role of intracellular free zinc in the regulation of Arg-1 expression in interleukin-4-induced activation of M2 microglia. *Metallomics* **2018**, *10* (10) , 1501-1509. DOI: 10.1039/C8MT00248G.
4. Sarah Tomas-Hernández, Jordi Blanco, Cristina Rojas, Joel Roca-Martínez, María José Ojeda-Montes, Raúl Beltrán-Debón, Santiago Garcia-Vallvé, Gerard Pujadas, Lluís Arola, Miquel Mulero. Resveratrol Potently Counteracts Quercetin Starvation-Induced Autophagy and Sensitizes HepG2 Cancer Cells to Apoptosis. *Molecular Nutrition & Food Research* **2018**, *62* (5) , 1700610. DOI: 10.1002/mnfr.201700610.
5. HyunTae V. Hwang, Darlene Thuy Tran, Michelle Nicole Rebuffatti, Chin-Shang Li, Anne A. Knowlton, . Investigation of quercetin and hyperoside as senolytics in adult human endothelial cells. *PLOS ONE* **2018**, *13* (1) , e0190374. DOI: 10.1371/journal.pone.0190374.
6. Pawatsanai Samutprasert, Khajeelak Chiablaem, Chanon Teeraseranee, Punrawich Phaiyarin, Puttikorn Pukfukdee, Prompong Pienpinijtham, Jisnusun Svasti, Tanapat Palaga, Kriengsak Lirdprapamongkol, Supason Wanichwecharungruang. Epigallocatechin gallate-zinc oxide co-crystalline nanoparticles as an anticancer drug that is non-toxic to normal cells. *RSC Advances* **2018**, *8* (14) , 7369-7376. DOI: 10.1039/C7RA10997K.
7. Marco Malavolta, Laura Costarelli, Robertina Giacconi, Andrea Basso, Francesco Piacenza, Elisa Pierpaoli, Mauro Provinciali, Ogo A. Ogo, Dianne Ford. Changes in Zn homeostasis during long term culture of primary endothelial cells and effects of Zn on endothelial cell senescence. *Experimental Gerontology* **2017**, *99*, 35-45. DOI: 10.1016/j.exger.2017.09.006.

[GO TO SITE](#)

Most Trusted. Most Cited. Most Read.

9. Gael Clergeaud, Husam Dabbagh-Bazarbachi, Mayreli Ortiz, Juan B. Fernández-Larrea, Ciara K. O'Sullivan. A simple liposome assay for the screening of zinc ionophore activity of polyphenols. *Food Chemistry* **2016**, *197*, 916-923. DOI: 10.1016/j.foodchem.2015.11.057.

10. Yuri A. Kim, Yury S. Tarahovsky, Elena A. Yagolnik, Svetlana M. Kuznetsova, Eugeny N. Muzafarov. Integration of Quercetin-Iron Complexes into Phosphatidylcholine or Phosphatidylethanolamine Liposomes. *Applied Biochemistry and Biotechnology* **2015**, *176* (7) , 1904-1913. DOI: 10.1007/s12010-015-1686-z.

11. Simona Piccolella, Severina Pacifico. Plant-Derived Polyphenols. **2015**,, 161-214. DOI: 10.1016/B978-0-12-802229-0.00005-0.

Partners



1155 Sixteenth Street N.W.
Washington, DC 20036
Copyright © 2020
American Chemical Society

About

About ACS Publications
ACS & Open Access
ACS Membership

Resources and Information

Journals A-Z
Books and Reference
Advertising Media Kit
Institutional Sales
ACS Publishing Center

Support & Contact

Help
Live Chat
FAQ

GO TO SITE



Most Trusted. Most Cited. Most Read.



F0
03

F0
99

F0
99

F1
6A

F0
9E

[Back to Homepage](#)
[4everproxy Premium VPN](#)

Issues / Requests / Support
Email us at [proxies\[at\]4everproxy\[dot\]com](mailto:proxies[at]4everproxy[dot]com)
This site is part of the 4everproxy Network